South Carolina Academic/Career Development Integration Activity

Title **Hubble Telescope (ES-2)**
Subject **Science** **Grade Level 4**

SC Content Standard – Astronomy – Grade 4. Standard 4-3. The student will demonstrate an understanding of the properties, movements, and locations of objects in the solar system. (Earth Science)

4-3.8. Recognize the purpose of telescopes.

National Career Development Guidelines Goal/Indicator
Career Management GOAL CM3. Use accurate, current, and unbiased career information during career planning and management.

Indicator CM3.K5. Identify occupations you might consider without regard to your gender, race, culture, or ability.

Career Development Objectives
1. The students will explain the purpose of telescopes.
2. Students will expand awareness of occupations that are connected to the fields of astronomy and space science.

Assessment
1. Students will give examples of some ways telescopes are used (participation in class discussions and observation).
2. Students will identify at least five occupations that are connected to the fields of astronomy and space science (participation in class discussions and observation).
3. Students will write a research report about the Hubble telescope.

Preparation
• Prior Learning—Instruction on telescopes and basic information about the solar system.
• Handouts/Worksheets—*N/A*
• Resources/Materials—textbook, resource books, access to the Internet and the library**,** writing materials…Note: See attached resource sheet for Internet resources and background information on the Hubble telescope
• Time Required—45 minutes plus homework and discussion

* Adapted from *Career Development Tool Kit Grades 6-8*, Linda Kobylarz & Associates, 2000. Used with permission.

Procedures
Part One

• Through this activity, students will explore the purpose of telescopes and will learn about some occupations related to the fields of astronomy and space science.
• Begin by asking students if they have heard of the Hubble Space Telescope (HST). Give them a quick "quiz" about Hubble. Note: Quiz and Hubble *Fun Facts* are adapted from http://amazing-space.stsci.edu/resources/explorations/mastermind/teacher/scientificbackground.html, a free site for educators.

Hubble Space Telescope Quiz

1. The Hubble Space Telescope is a manned satellite, with astronauts living and conducting research on it as it orbits the Earth. **True or False?**

2. The Hubble Space Telescope can only "see" the visible area of the spectrum. **True or False?**

3. The Hubble Space Telescope can observe celestial bodies better than other observatories because it is closer to them. **True or False?**

4. The Hubble Space Telescope travels to the celestial bodies and takes pictures of them. **True or False?**

5. Where is the Hubble located? Hubble is about 380 miles (611 kilometers) above Earth, just above our planet's atmosphere.

6. How big is the Hubble? It is the size of a school bus (43.5 feet, or 13.3 meters long) and weighs more than 12 tons (11,000 kilograms).

7. How did Hubble get its name? Hubble is named after U.S. astronomer Edwin P. Hubble who, early last century, discovered galaxies beyond our Milky Way galaxy and determined that space is expanding.

• Share with the students some fun facts about the Hubble.

1. The Hubble Space Telescope whirls around Earth at a speed of 5 miles per second. If cars moved that fast, a coast-to-coast trip across the continental U.S. would take only 10 minutes.

2. Each day, the Hubble Space Telescope collects enough data to fill an encyclopedia.

3. Images and data collected by the telescope travel 90,000 miles over satellite and ground links before they reach the Space Telescope Science Institute in Baltimore, MD.

• Explain that telescopes are designed to help us better understand the universe and our place in it. The Hubble has helped us make many incredible discoveries about our

solar system and distant galaxies. It has advanced the science of astronomy by leaps and bounds.
• Tell students they will explore some of these discoveries by researching the Hubble and writing a short report that discusses at least two of Hubble's discoveries.
• Review research resources with the students. Assign the report as homework.
• After students complete their reports, have them share their findings with the class.
• The website http://amazing-space.stsci.edu suggests many hands-on activities about the Hubble and telescopes in general that you might want to use to extend this lesson.

Part Two—Career Development Connections
• Have students brainstorm the names of occupations in the fields of astronomy and space science.
• Ask students if they might be interested in this kind of work.
• Optional: Invite to class a guest speaker who works in this field.

Crosswalks
SC Career Guidance Standard/Competency
Learning to Work Standard 1. Students will understand the relationships among personal qualities, education and training, and the world of work.
Competency 1.3. Explore career interests and related occupations.

Key Employability Skills
Thinking Skills—Critical thinking
Information Management—Acquires, interprets, and communicates information

Resources

The following information resource list was adapted from the website: http://amazing-space.stsci.edu/resources/explorations/mastermind/teacher/scientificbackground.html

Hubblesite Hubble Primer -- http://oposite.stsci.edu/pubinfo/spacecraft/Primer/ -- produced at the Space Telescope Science Institute, this Web page offers valuable information to educators and students about the Hubble Space Telescope's mission. The Primer is written in non-technical language and includes features such as: Planning Hubble's Day, Hubble's Top Science Findings, Preparation for a Career in Astronomy, and information on how to contact other NASA sites.

HubbleSite -- http://hubblesite.org/ -- the Hubble Space Telescope's website at the Space Telescope Science Institute. Here you can find background information on the telescope, pictures and news releases of past and present stories, education activities, and other science resources. Contains news releases of Hubble's science and remarkable discoveries, illustrated facts about the telescope and its instruments, and gorgeous pictures of stars, planets, galaxies, nebulae, and more.

Hardcopy versions of images taken by the Hubble Space Telescope and other NASA missions are available at your closest NASA Educator Resource Center at http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/, or they may be downloaded from the Space Science Education Resource Directory (http://teachspacescience.org).

Images taken by HST. They can be printed from the "Decade of Discovery," http://hubblesite.org/discoveries/10th/photos/indexspace.shtml. Each of the 20 images contains a short caption with an option to read a longer version. The longer caption provides a link to the full press release. The image also can be enlarged so that it can be printed and used in the classroom.

Where is HST Right Now? -- http://liftoff.msfc.nasa.gov/RealTime/JTrack/Spacecraft.html -- the NASA Marshall Space Flight Center tracks the position of HST and other satellites. Users also can customize their view.

What's a Hubble? -- http://www.thetech.org/exhibits_events/online/hubble/wuzza.html -- Sponsored by Hypertech and created in partnership with Lockheed Martin, this site answers questions about the Hubble Space Telescope's mission, such as: Why do we have a space telescope? How do astronauts service the Hubble? How do scientists point the telescope in the right direction?

Space Science Education Resource Directory - http://teachspacescience.org -- a convenient way to find NASA space science products for use in classrooms, science museums, planetariums, and other settings.

NICMOS -- http://nicmos.as.arizona.edu/ -- A Website sponsored by the University of Arizona on NICMOS. The site provides an instrument overview, science results, and links to NICMOS-related sites.

The Online Planetarium Show -- http://library.thinkquest.org/3461/index.htm -- an educational site, teaching fun and interesting lessons in astronomy and in related subjects. It contains an interactive planetarium program called "Hubble: From Here to Eternity," including spectacular images from the Hubble Space Telescope, the telescope's incredible findings, and other interesting topics.

Hubba, Hubba, Hubble -- http://library.thinkquest.org/3461/game.htm -- the Online Planetarium Show's word puzzle. This interactive word puzzle is reveals information about astronomy and the Hubble Space Telescope. Tackle the puzzle after visiting the Hubble Online Planetarium Show.

The Hubble Project - http://hubble.nasa.gov/ -- a Hubble Space Telescope Website sponsored by the Goddard Space Flight Center.

Astronaut Biographies -- http://www.jsc.nasa.gov/Bios/- provides biographical information on those who participate or have participated in NASA's space flight programs as candidates for, or members of, space flight crews.